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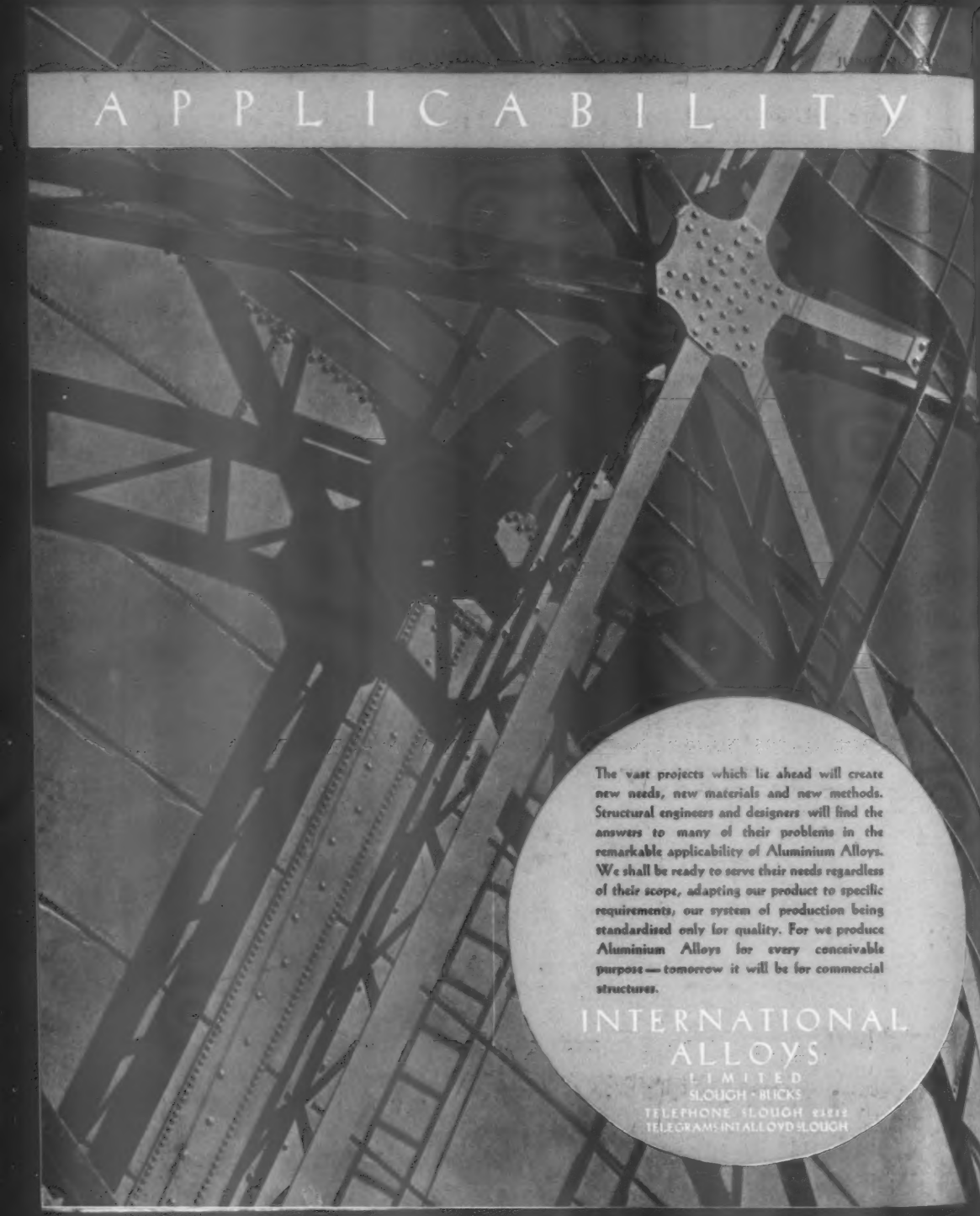
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FOUNDRY TRADE JOURNAL
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"The End of the Beginning"

Lord Riverdale quoted the famous phrase by which Mr. Churchill so aptly summarised the outcome of the battle of El Alamein, on the occasion of the opening of the new laboratories of the British Cast Iron Research Association. It is particularly apt for, examined in retrospect, the first five years of its existence were full of disappointments. There was but little enthusiasm in the industry for research, and as no lead came from those directing the affairs, even the pioneers were losing heart. Then, consequent on Mr. J. G. Pearce's appointment as director, a slow but sure progress was made. The financing of those associations formed soon after the last war was fundamentally wrong, as only income was provided, but income devoid of capital only induces conditions which the Beveridge plan is designed to ameliorate. Thus the long struggle was started to create a capital sum which would enable the Association to be properly housed, and adequately equipped to carry out research. Yet to raise capital the Association had to arouse interest by producing research reports of a worth-while character. Each of the distinguished presidents in turn made his annual appeal for additional support, Lord Dudley being the first actually to launch a definite scheme for the creation of a building fund. Then, since the war, under the dynamic presidency of Mr. Percy Pritchard, advantage was taken of existing conditions, not unconnected with the attentions of the Luftwaffe, to acquire a country mansion beautifully situated some way out of Birmingham, which appears to be entirely adequate for the purposes of a research establishment. The difficulties to be associated with rural surroundings, such as an adequate supply of electricity, gas and water, have been successfully overcome—matters not lightly to be dismissed in the midst of a great war. Obviously, there is ample room for expansion and if planned carefully, as has been done so far, the amenities of a charming area can be preserved, much as is the case with Bushey House at Teddington.

Sir Edward Appleton in his speech emphasised the need for education to be linked up with research associations, and also said that he believed that governments in the future would not be parsimonious in their attitude towards research. The two notions must be taken together, for it is not the slightest use possessing well-equipped buildings if conditions are such that there is a dearth of properly trained scientists to staff them and the money available to pay them salaries at least as attractive as those available in competitive industry, or the Universities. Normally, there is but little difficulty in attracting young men from the Universities and technical colleges, but after a few years with the research associations the higher salaries accorded by industry thin the ranks of the research associations. The foundry industry has certainly reinforced its metallurgical potential to the detriment of the Research Association. Nobody is to blame, for research associations must continue to be training grounds for young scientists, but this must be recognised by the industries they serve and a *quid pro quo* must be given in the form of financial support to enable the association to surround itself with the best brains money can buy to ensure that supply of young scientists plus the acknowledged benefits of co-operative research.

If the Research Association is now at "the end of the beginning," the industry it serves must vitalise its work by wholehearted support, both personal and financial, and it behoves everyone associated with the founding of cast iron to extend to the Research Association his benevolent collaboration so that in the post-war world British cast iron will be able to face its competitors, whether metallic or plastic, with confidence and an unchallenged quality.

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POST-WAR AMERICAN METAL TRENDS

Much has been said about the possibility of replacing steel with aluminium and magnesium after the war. It is quite probable there may be some replacement in the motor-car industry, and that the experience gained in the use of light metals by the aircraft industry will be passed on to the automotive industry. The degree of such replacement, however, will be predicated on relative costs and quantities which will be required to satisfy comparable mechanical strength and service, considers W. A. JANSSEN, of the U.S. Department of Commerce, in a recent address to the Institute of Scrap Iron and Steel Inc.

It is, however, quite probable that a considerable tonnage of magnesium and aluminium may be used to replace certain copper and brass mill products not only because of a closer price relationship between these products and those made from magnesium and aluminium than products of iron and steel, but also to conserve America's rapidly depleting non-ferrous metal resources.

To what degree plastics and other substitutions for iron and steel will continue to be used after the war will depend largely on wartime experiences in the use thereof, and the relative costs compared with steel in order to meet competition, he believed.

On the question of scrap, he said that up to now the prime interest in scrap had been for the direct production of iron and steel. Notwithstanding the large blast furnace capacity which will be available after the war, it is quite probable that consideration will have to be given to the conservation of scrap in order to forestall the rapid depletion of high-grade iron-ore reserves. He visualised the possibility of a change in steel production technology in order to conserve these ore reserves, and which in all probability will necessitate the use of a larger percentage of scrap than formerly. This new demand will have to determine if this increased requirement for scrap can be met from domestic sources. In order to meet this increased demand for scrap it is quite probable that instead of being an exporter America might become an importer and processor of foreign scrap.

Metallographical Research in Sweden

A special committee appointed by the Swedish Government to investigate the need of new research institutions has recently submitted a proposal for the establishment of an institute for iron and steel research, for carrying out metallurgical research in close co-operation with the various iron and steel works in the country and the Jernkontoret. The present Metallographical Institute in Stockholm will be incorporated in the new organisation. It is proposed to erect the institute near the Royal Technical University of Stockholm. The building costs are estimated at 1,200,000 kr. (£70,000), and those for the equipment at 500,000 kr. (£30,000). It is suggested that the State shall pay for the erection and maintenance costs of the buildings, while Swedish industry shall undertake to bear the expenses for the equipment and the research work.

PORCELAIN ENAMELLING AIRCRAFT EXHAUSTS

The rustproofing of aircraft exhaust manifold systems and mufflers made of SAE 1025 steel has been a problem because of the cracks which develop in these parts due to a combination of the high stress concentrations which normally accompany the welding of these steels, and continued vibration of off-centre loads at elevated temperatures. Thus rustproofing must either relieve stresses, or must permit rewelding of cracks, a requirement which eliminated baked-on enamel or metallising. The Taylorcraft Aviation Corporation has recently solved this problem with porcelain enamel coatings. The heat used in firing the coating helps in stress-relieving the welded joints, and the coating holds the heat long enough to re-anneal the exhaust unit after each running of the motor. The units are now in quantity production, with no failures to date. The exhaust stacks and mufflers to be treated are first put through a pickling process, then dipped in heat-resisting enamel, passed through a drying oven and thence to the firing furnace. Firing at 1,600 deg. F. fuses the enamel into the pores of the metal. Temperatures in actual operation of the airplane seldom reach 1,200 deg. F. The same procedure of drying and firing is repeated after a second coat of enamel is sprayed on. The resulting weight increase is about 1 lb. for each motor.—"Iron Age."

A NOVEL IDEA FOR CORRECTLY CORING MACHINE-MADE MOULDS

(*Concluded from page* 96.)

need a core iron. The two halves are struck off level, claywashed and brought together in correct relation by using the locating pins in the usual manner.

The top half of the corebox is removed from the core containing the iron support (see Fig. 2), and the bottom half of the mould is placed on the half corebox containing the green-sand core, again using the pins for correct location. The mould and half corebox are turned over and placed on the casting floor, as is shown in Fig. 4. The remaining half of the corebox is then removed leaving the green-sand core in the correct position in the mould.

By extending the core prints as shown, the core becomes self-supporting, thereby eliminating the use of chaplets. The castings so produced are accurate and free from overlap at the joints, also consistently even in thickness; moreover, a considerable saving in time is effected over the ordinary method of making hard cores and fixing same in the moulds by hand. A feature of interest is the design of the core iron. It would be impossible to draw this iron from the casting without fracture if it was a one-piece iron, but by making the core iron jointed to swivel at one end, it can be readily withdrawn from the elbow and used over and over again.

The method of manufacture explained above results in a considerable saving of oil core sand, and in the case of the elbows illustrated, by using the green-sand core 5 tons of prepared core sand are saved for each 1,000 castings.

FLUID PRESSURE IN FOUNDRY PRACTICE

Theory and laws of fluid pressure; its calculation in moulds and an analysis of comparative examples

By E. LONGDEN, M.I.Mech.E.

(Concluded from page 69)

Discussion

MR. A. HOPWOOD (Liverpool), opening the discussion, said that by a coincidence he had just visited a foundry which was experiencing difficulty with test-bars, where a remark made by the foreman moulder was quite applicable to a viewpoint held by a number of foundrymen concerning the application of liquid pressure and risers. He then explained the point by means of a diagrammatic sketch on the blackboard, indicating that the method of casting the bars was effected by means of a simple down-runner. When the foreman was asked if he had considered putting the riser on the back side, namely, by putting an additional feeder on the back, his remark was that that reduced the pressure on the mould.

What was Mr. Longden's opinion concerning this point, because he (the speaker) considered it to be an error? The effect of putting a riser on any part of a casting would raise the pressure and carry the pressure to the same height, so that the down-runner did not release the pressure. He confirmed the statement as to the ill-effect of soft ramming, and there was nowadays a tendency for moulders to soft-ram. A perfectly sound mould could be obtained which, however hard-rammed, resulted in a perfectly flat face without scabs.

Use of Tying-down Bars

Another point he wished to raise was with respect to the screwing-down tackle, as it was called in the foundry, particularly with regard to large areas of, say, 18 ft. sq. or 18 ft. by 16 ft., or of that order. The distance between the tying-down bars and the holding-down tackle was very important. It should be borne in mind also that the fewer tying-down bars it was possible to use, the more quickly the job could be got together. The majority of such large jobs, when they had the top part on them, had to be screwed down—probably taking about 6 hrs. The more bars there were the faster it was necessary to work in order to get the job together. This was a technical factor which should be borne in mind.

Support must be given to Mr. Longden's contention with regard to using weight. It was found in the case of a serial job of what were called Diesel "A" frames, and which took up almost 16 ft. by 18 ft., that allowances had to be made for the straining of the top part. Screwing down could not entirely eliminate it. If the attempt was made entirely to do so with tackle, it would probably be found that bars would be required for every 5 or 6 ft. One could screw down a 16-ft. top bar with two tying-down bars, with the judicious use of weights at the corners and wedges in the appropriate places.

Test-Bar Technique

MR. LONGDEN agreed with Mr. Hopwood in respect to the test-bars. With two heavy sections connected by a lighter section, such as obtains in a test-bar, it is not quite possible to feed through the thinner section to the heavier section at the opposite end of the bar. The pressure depended not so much upon the number of headers or risers put on a casting, but rather on the head height and the time that the head metal would take to solidify. If the head could be kept open for a sufficient length of time in order to feed the heavy section, then the additional feeder, or additional riser, was not detrimental, but rather an additional insurance to feed the casting. It is unwise to pour a test-bar from two ends. Where the two streams of metal meet—in the important central area of the bar—there was every possibility of a collection of sullage and oxide films; hence the yield-strength will be lowered.

MR. C. G. FORREST (Stockport) thought that, speaking broadly, the lecture was a plea for a better understanding of the conditions of pouring moulds and for the more thorough venting both of the mould and of the cores as well as taking great care that the orifices, where the vents came out to the air, were not stopped up at the last moment.

"Straining Downwards" and Lost Castings

MR. A. SUTCLIFFE (Bolton) recalled a member citing the case of a casting which had strained downwards—all castings strained downwards as well as upwards. The ramming had been done quite satisfactorily, but there was a sand bed beneath the excavation for the mould. The result was that there had been a straining into the sand bed and the metal had got away. In one case, when making blank wheels, the pressure came on after casting about three or four tons. The noise of the blast which occurred was like that of a gun. In a second case a square condenser was being cast, but the metal percolated through the bed and was never found again.

Mould Explosions

MR. LONGDEN, following upon Mr. Sutcliffe's remarks and the incident of a gas explosion in the large blowing engine liner core, referred to during the course of the lecture. At a certain moment, soon after pouring had developed, an explosive mixture of gases collected on the inside of the open core. It was the practice to place wood shavings on the inside of the core and light them a minute before pouring commenced in order that the products of combustion might take the place of most of the air in the large cavity of the core, and thus prevent a mixture of gases of an explosive nature during pour-

Fluid Pressure

ing. In the case referred to, something went wrong in the lighting of the shavings just before pouring commenced. Instead, it was left to a spark from the metal to drop into the core cavity and light the shavings just—as fate would ordain—at the worst moment, when an explosive mixture had formed from the gases given off the core and the air inside the core. The result was a shattering explosion, and much of the loam on the casting side of the core was projected into the mould cavity or the metal of the casting. This kind of thing occurs in a smaller way in many other types of moulds and cores, and they constitute unseen incidents of which the foundryman had no direct knowledge at the time they occurred. In the case of the hydraulic cylinder outlined, there was a tell-tale at the top end of the mould, about 1 ft. from the upper face of the head. When the metal issued from the "tell-tale" outlet, pouring was arrested until the hole was stopped with a clay bob. The remainder of the head area was then filled with metal.

MR. A. SUTCLIFFE asked if there was any advantage in covering the beds with a loam top, compared with covering with boxes and bolting them down. Dealing with his own experience, there would be three parts covering a job probably 28 to 30 ft. long. There would be three tops, and they would have to put the particular boxes up against a wall for perhaps a period of a week, and they might be knocked about a bit. He had not experienced any trouble with respect to the bolting-down tackle.

Universal Plates

MR. LONGDEN said there was not the slightest doubt concerning the efficiency of the universal plates he had designed. It was perhaps unnecessary for him to state that if there were deep irregular lifts below the straight face of the joint line, probably the necessary combination was that of an ordinary soundly rammed top-part moulding box. But many types of lifts could be supported by cast-iron grids, rammed to the common flat surface and bolted to the universal top plate. When using the ordinary moulding boxes, many scores of lifters or grids and wedges and packing between the core face and the underside of the moulding box were needed. The universal top needed none of this attention. The surface of the plate was simply covered with an inch of loam in a matter of minutes, compared with days to ram the box parts. Ordinary loam plates were usually made for one-off jobs, or when the same type of casting was repeated at intervals. As a rule, they would suit only one or two classes of castings. But the universal plates were employed daily for a wide range of castings.

The universal plate was constructed of cast iron punctured with numerous cells to take care of venting and the gating system, as well as providing holes through which core bolts might be passed. They had been constructed in various ways; the best design consisted of what was really a composite plate. For instance, 12 ft. sq. top plates were made in three sections cast at the same time in the same mould. There was a central section, an inner frame surrounding the inner section. and an outer frame surrounding the inner frame. The sections were separated in the mould by 1 in. wide splitting cores. The sections were linked together by passing wrought irons diagonally through the splitting cores and into the metal on either side of the splitting cores. The object of all this was to take care of the expansions which take place. Plates will crack and fracture not merely through inherent casting stresses, but from repeated heating and cooling when subjected to casting operations. This remark applied especially to the central portion of the plate on which expansion was particularly rapid. If this expansion is not allowed for, then the plate will burst and fracture. That was what happened with the ordinary loam plates. The design of the universal plate took care of expansion, since the sections had the opportunity to expand individually.

The Double-flash Defect

MR. A. HOPWOOD asked if Mr. Longden had ever, in the case of a large surfaced casting, found a double surge showing on the flash, namely, when the metal hit the top and there was a flash coming over the top. Although a job might be securely held down, this was particularly pronounced in the centre of the large top parts, where the spring was apt to show most, and not at the ends, which were securely held down.

MR. LONGDEN, agreeing, said it was very evident in a bed with camber; it was bowed down in the centre. In rising the metal flowed in and filled in the flash. Then, with the final and complete filling of the mould with metal, there was a secondary flash formed. This could be avoided by strengthening the mould and by adequate weighting or bolting down.

MR. W. BROWN (Manchester) agreed with the application of pressure or fluid feeding, because he was fortunate, or perhaps unfortunate, enough to serve his apprenticeship in a foundry which knew no risers. He was speaking more particularly of bronze than of iron founding. Bronze castings were produced up to 5 tons in weight. They never had anything more than a 2-in. down-runner, or 2- or 3-in. down-runners to spread the metal to the bottom. The height of the down-runner sometimes extended to 5, 6 and 7 ft. above the foremost portion of the casting. To sound a warning note, methods of moulding would have to be revolutionised. There should not be any attempt to cast any sort of casting with 5, 6 or 7 ft. head pressure unless precautions were taken at the bottom. Beds must be very carefully constructed, as Mr. Longden had pointed out, and the mould very securely rammed. The cores had to be treated in very much the same manner.

Modern foundry practice had laid too little stress upon fluid or pressure feeding, partly because, apparently, foundrymen were afraid to ram. There was no reason for such fear. A foundry with which

he had been connected had been carrying out this practice for 60 or 70 years, only experiencing failure on very rare occasions. Castings had had to withstand as high as 3,000 or 4,000 lbs. pressure, and they had been successfully cast with high pressure and no risers. It should be emphasised that moulds must be carefully made before they could withstand such pressure. He dissented from Mr. Longden's remarks that pressure ceased to be exerted after the runner had set. Possibly this was so to a certain extent, but the pressure was being exerted while the runner or the down gates were being filled. It was at that part where the structure of the casting exhibited its weakness, rather than from a lack of atmospheric pressure after the casting had been filled.

MR. LONGDEN said there was certainly feeding taking place even when a skin was formed on the outside of the feeder, but it was then gravity feeding only. The work of Taylor and Rominski pointed this out very clearly, namely, that in addition to feeding by gravity there was the pressure of the atmosphere, equal to 14½ or 15 lbs. per sq. in. If some surface of the feeding metal area could be kept open to the pressure of the atmosphere, then it was atmospheric pressure plus gravity. More attention should be paid to the work of Taylor and Rominski.

Steam Pressure Feeding

MR. W. HOLLAND (Manchester) referred to the utilisation of steam. When visiting a Scottish firm, it was seen that, instead of rod feeding the jobs, they had steam-fed flywheels up to 15 tons. On the head of the runner boxes they put a loam-plate, with soft loam. Had Mr. Longden considered the question of steam pressure? If so, his experience would be interesting. In some foundries, with smaller boxes, instead of rod feeding they used a mixture of wet black sand.

MR. LONGDEN said he had made some experiments. He had mentioned the use of gases to aid feeding or, rather, for compressing metals, but that was done mechanically and in a very definite and controlled manner. Steam feeding was dependent upon the complete exclusion of the atmosphere, otherwise the steam would escape and the pressure of the steam lost. He was of opinion that much better results could be obtained by the atmospheric-pressure method. If the top portion of the head was covered with a refractory so that atmospheric pressure could continue to be exerted until the casting had solidified, then it was easier and as effective to impose the ordinary heads or feeders on castings. This object can be aided by introducing high-temperature metal to the feeder and then covering it with a refractory or a material giving an exothermic reaction.

MR. R. S. TURNER referred to the illustration of the upright casting. Would it be better if the cores were sprigged? Also, was the lift calculated? Taking off the weight of the box and various other things, there was about 125 tons, to which 20 per cent. was added. Should not the 20 per cent. be on the 300 tons and not on the 125 tons?

MR. LONGDEN said that, so far as sprigging was mentioned, he thought that Mr. Turner must be referring to moulds for small castings. The tremendous lift on the upright mould and its cores had to be very soundly resisted. The 20 per cent. allowance was a rough-and-ready calculation. He would agree to amend it by suggesting that the allowance could with added security be based on the gross amount, but the original basis was enough.

Atmospheric Feeding

MR. D. FLEMING (Manchester) referred to atmospheric feeding. He thought it was important that the core, which was inserted for the purpose of allowing the atmosphere to reach the centre of the blind riser, should have sharp edges, or have a section which would allow a break-through from the atmosphere to the centre. Some small experiments which had been carried out on the practical application of the method did indicate that this was not a matter to put aside and forget. It was really worth consideration.

The next point he wished to make did not really concern the subject-matter of Mr. Longden's Paper, but he would like to raise the question of test-bars. A point which must be now in mind was the condition of the second riser and the condition in which the metal was poured in. If the section was shown from the left-hand side, there was a temperature gradient to be taken into consideration, and there was a tendency of their being much colder metal on the right-hand side, so that the riser was not as effective as it might be made to appear. His practice was to cut out a thin section and cast the bars in ordinary D-section. They were run in and fed in at one end only, relying upon the temperature gradient, so that the hot metal was at the top and the coldest metal was furthest away. There was a danger of complicating the position by having two feeders.

MR. LONGDEN was pleased that Mr. Fleming had added this further point about the "blind riser." Although he had omitted to refer to the sharpening of the core, it was mentioned in the text of the Paper. He had missed it when departing from the reading of the Paper. The core needs to be sharpened so as to create the much-desired hot area or spot. The core, moreover, should be of a porous nature. If the test-bar was cast with one uniform section, it would be necessary to machine much metal off the bar; consequently a lower yield would be obtained from the test on the more open-grained metal of the inner zone of the original section. He would prefer to impose two feeders, but not to pour from two points, whereby there will be a meeting of two streams of metal and probable unsoundness there.

Aluminium as Flux

MR. W. COLLINGE (Bolton) knew that Mr. Longden was a great believer in aluminium as a flux. Suppose a 12-ft. cylinder had to be made about 24-in. outside diameter with 18-in. core. If the only barrel available was 10 in. dia., and it had to be

Fluid Pressure

built up, would Mr. Longden adopt the method which he (the speaker) used, namely, to build up with plates for the space of 6 in. sections up to about 3 ft. from the bottom? Referring to the illustration of the upright shown, Mr. Collinge said it was noticeable that was run on the side, with all the studs on the thinnest section. The thick section was the other side. What was the object of this? Was it so that the metal coming into the thick section was not quite so hot? Was it to neutralise open grain, or to eliminate sponginess, or for some other reason?

MR. LONGDEN replied that the use of flux at the spout in the metal for heavy castings was not usually practised. There were inoculation methods whereby the quality of the metal was improved. Lectures had been given to the members of the Branch showing how metal could be improved by introducing certain elements which might be present in the original pig-iron, such as silicon, which, in a way, did act as a flux. But, with straightforward castings like the cylinder described it was just a strong cylinder iron, containing 0.9 per cent. silicon, 0.3 per cent. phosphorus, and about 3 per cent. carbon.

MR. COLLINGE asked whether the lecturer would advise the use of a flux on a thin section, say a 1-in. section, which had to be free from gasholes.

MR. LONGDEN said that since graphite was precipitated when introducing aluminium, it would increase fluid by up to a certain small percentage. Even the fluidity decreased with a high percentage of aluminium. About an ounce was required to a ton of metal. He did not think Mr. Collinge would experience any difficulty with the 12-ft. casting, 24-in. dia. An ordinary loam core, if properly built up, with the rope or hay band, the hay band material being properly separated on the core barrel itself. That is to say, if the rope or hay band did not prove to be a continuity over the barrel, then the core should not take any harm. The position could be made much safer, however, by introducing the usual strengthening rods.

The comment about the running of the column was important. The runners were introduced into the mould at a point well away from the sliding surfaces of the casting. Actually it was fatal to run castings of that description in the heavy section, which happens to be the most important part of the casting. There was erosion of the sand, and especially so from big bodies of metal. It was his practice to run them well away from the important surfaces. Again, the surfaces were densened, and Mr. Collinge would be well advised not to let the metal impinge directly upon denseners.

Continuing, Mr. Longden said he had hoped, as a rounding off to the lecture, to be able to say something about studs, but there was not sufficient time left to show the slides. He had carried out some experiments. As was well known, there was a shortage of tin nowadays. When some materials other than tin were used, as well as tin itself, it was really astonishing to find that the only studs which really gave a sound section when cut across the stud and the parent metal were those which were simply ground clean or machined, such as threaded cast iron or steel. Other coatings showed a blown condition.

MR. FLEMING again referred to test-bars, and said he had been speaking mainly of the 88-10-2 type. Most of the production of his test-bars, unless specifically requested otherwise, were cast in a horizontal position.

The lecturer was accorded a hearty vote of thanks, on a proposal made by Mr. Holland and seconded by Mr. Sutcliffe.

APPENDIX

During the discussion on the part played by metal studs to withstand solid and fluid pressures reference was made to unfinished tests carried out to ascertain the relative merits of various castings on ferrous studs against uncoated metal. On conclusion of the tests they were more fully discussed at Lincoln.

Fig. 14 illustrates, diagrammatically, how the tests were made and some results.

The test consists of the location of studs in two cast-iron bars, 21 in. by 3 in. by 1 in., spaced at intervals of 3 in. The bars were notched at N to induce a fracture across the stud. The ingates, A, were placed to flow directly at the stem or central portion of the studs, in all cases. The ingates were fed by the two down-gates, B, of ample proportions to ensure equal pressure at each inlet point. Outlet gates were placed at the locations R, and since the studs were subjected to, as near as possible, the same temperature and quality of metal, conditions were similar for all types of studs.

The condition of the studs before inserting into the moulds were as follow:—

Coating.	Condition before Coating
1. Zinc	Bright clean metal surface.
2. Tin	,, ,, ,,
3. Copper	,, ,, ,,
4. Nickel	,, ,, ,,
6. Lead solder ..	,, ,, ,,

The nickel and copper coatings were electrically deposited.

5. Tin with coating as purchased.
7. Blue-black oxide film.
8. Smear of oil on the brightly-cleaned surface.
9. ,, ,, ,, ,, ,, ,,
10. ,, ,, ,, ,, ,, ,,
11. ,, ,, ,, ,, ,, ,,
12. Red lead on the stud and plates, without resorting to brightly cleaning the surfaces.

Three separate tests were made repeating the arrangements and conditions described above. In the first test the mould and gates were simply filled in the ordinary manner. In the second test an excess of about 1 cwt. of molten metal was allowed to flow through the riser gates. With the third test an excess of about 2 cwts. of metal was allowed to flow through the mould.

Fig. 14 illustrates, approximately, the condition of the studs in the third test. The blown condition around the studs can be attributed to, firstly, the burning-on of the studs and the gas from both the overheated stud and the coating. The blown condition was less pronounced in the second test, when 1 cwt. of excess metal had passed through the mould and still less pronounced in the first test when only sufficient metal was passed into the mould to fill it and the runner and riser gates. The blown condition was most pronounced in No. 12, and the rest of the blown areas in the following order as to degree of defect, starting with the most defective: No. 12, 7, 6, 5, 1, 2, 4, 3, 8.

The heavier studs, Nos. 9, 10 and 11, came out very satisfactory and no defects were encountered. The defect around the stud No. 8 was very small.

The conclusions are that the best results can be obtained from perfectly clean, bright studs which are of such dimensions or located in the mould where they will not become too hot or approach the melting point. It would appear that the practice of tinning studs has grown up due to the need to protect the surface of the stud from oxidation and foreign matter from the time it is manufactured to the time it is used in the foundry.

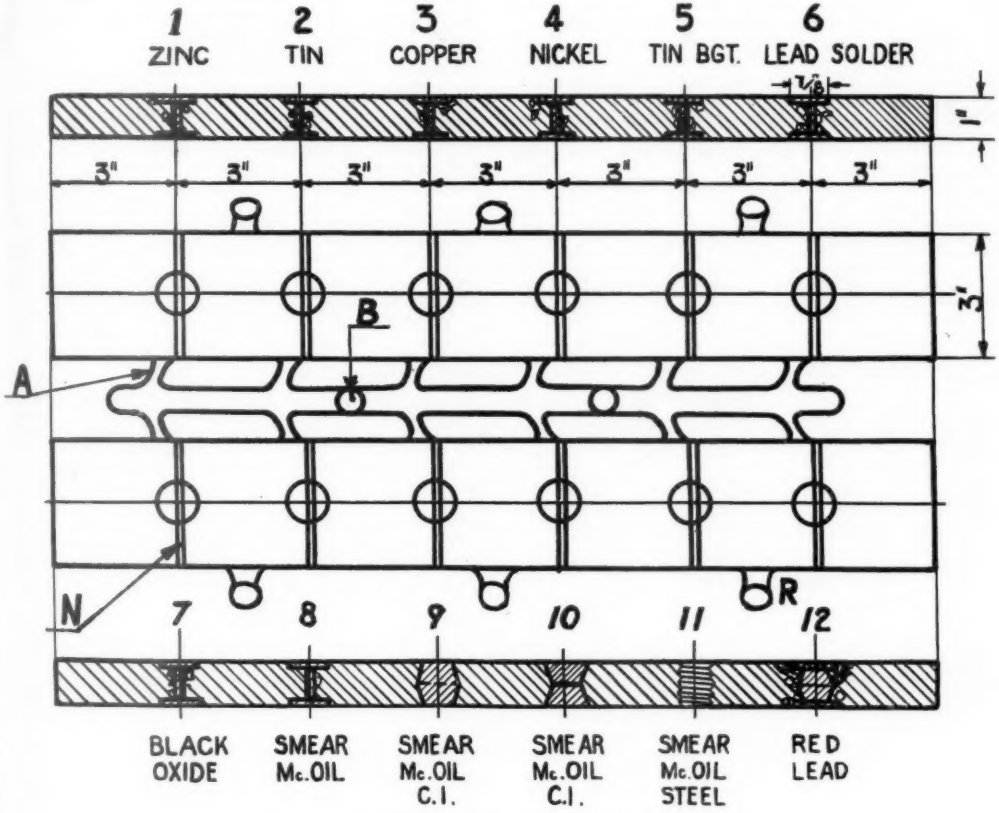


FIG. 14.—DIAGRAMMATIC DETAILS OF PRESSURE TESTS.

THE PAPER CHASE IS STILL ON!

A NOTE ON THE PRODUCTION, MELTING AND CASTING OF MAGNESIUM*

By J. P. P. Jones

At the end of the war it will no doubt be revealed that the production of magnesium has increased by many times the amount produced in 1939. A curious feature, however, is likely to be that while aluminium and other metals will be found to have made comparable increases, members of the foundry industry will not have enlarged their knowledge and experience of magnesium proportionately. One may to-day find aluminium, manganese bronze and special irons melted and cast in many small foundries which would have looked askance at them before the war, but will not, however, find in these same foundries that magnesium is being melted and cast. This is due to the fact that the production of magnesium lies in the hands of a few companies holding patent rights or licences for the process they employ, and they in turn will normally only supply their metal to casters who apply to them for a licence. Such licences were not numerous before the war, and development has been along the line of increasing the capacity of such firms rather than their number. It is possible, however, that the number of licence holders may increase considerably after the war, and this alone makes greater familiarity with casting and melting magnesium desirable.

Since the production of magnesium will most probably remain the specialised work of a relatively small number of firms, all that need be said about this aspect of the matter is that magnesium is produced from magnesite and kindred material, which is found in most parts of the world, but principally in Central Europe, Russia and on the continent of America. It is reduced to metallic form by various well-known processes.

Foundry Processes

In the hands of the caster the metal can be used for two purposes—sand casting or die casting. Magnesium alloys can also, of course, be used for forgings and extrusion work, but this aspect of the metal is again something of a speciality, and it will be the two uses mentioned which will be of the widest interest.

The melting procedure for die-casting differs slightly from that followed in sand-casting in so far as a modified method is employed to allow for the fact that the metal is held in a bale-out furnace. For brevity's sake, however, it will be best to describe here the procedure followed in sand-casting.

The first point which occurs is the outstanding fact known to all—and to some indeed by unfortunate experience—that molten magnesium has an affinity for oxygen. In other words an unprotected molten surface quickly burns. This is the point in which magnesium differs from almost every other metal or alloy in common use to-day. To protect the surface and so prevent burning, a liberal use has to be made of suitable fluxes. There are several types of these and various methods of using them. Some casters use initially a thin liquid flux, followed by a thicker crusting flux. There is said to be a French method of using as many as three different types of fluxes on the same melt, but a procedure followed very extensively in this part of the country is to use a single flux for all purposes. All these fluxes, however, contain substantially the same basic compounds, such as anhydrous magnesium chloride, magnesium fluoride, potassium chloride, etc., etc.—the chief difference occurs in the proportions in which these compounds are added to the mixture.

Flux to a total of 5 per cent. is added to the melt at a very early stage, and thereafter continuously to maintain a cover. Before pouring it is customary to stir the melt thoroughly. It will be observed that the greater part of the flux disappears from the surface as it absorbs the oxide and other impurities and sinks to the bottom of the pot. This is known as the washing action of the flux. In the case of magnesium the surface must not be left any length of time unprotected, and a crusting or protecting cover must be provided by a second application of flux. This is necessary as at this point it is a general practice to super-heat the metal to temperatures ranging between 800 deg. C. and 900 deg. C., and then allow it to cool rapidly—the effect of this rapid cooling is to reduce the grain size and so increase the physical properties of the casting. The metal is generally cast somewhere about 750 deg. C. Great care should be taken to skim thoroughly and see that no flux from the pot enters the mould, as a flux inclusion in the metal can cause considerable trouble and most frequently results in the rejection of the casting. The cause of this is the presence of anhydrous magnesium chloride—an essential constituent of the flux, but unfortunately one which is very hygroscopic. It absorbs moisture from the atmosphere, and it will readily be seen that corrosion will be set up in such circumstances.

Magnesium unfortunately is rather prone to corrosion troubles, but recent research seems to indicate that by adjustment of the constituents of the alloy this trouble may largely be overcome. Present practice is to protect the surface by some such method as chromating.

Moulding Practice

Much might be said of the moulding practice, but space demands that only the essentials be touched upon. First and foremost is permeability of the sand—an open silica sand is generally used with a binder of a bentonite or Fulbond type. Moisture must be reduced to a minimum (*i.e.*, a maximum 5 per cent.), and either into the sand or into the completed mould an inhibitor must be introduced, such inhibitors are commonly mixtures of boric acid and sulphur or ammonium bi-fluoride.

Magnesium may be compared to manganese bronze and similar alloys with regard to moulding technique—

* A prize winning entry for a Short-Paper Competition organised by the London Branch of the Institute of British Foundrymen for new members.

Magnesium Founding

like these alloys turbulent pouring recreates oxide—in the case of manganese bronze it is aluminium oxide which is formed of course, and in the case of magnesium it is magnesium oxide. For this reason and also to prevent any flux being carried into the casting, bottom pouring is frequently resorted to and even, as in manganese bronze again, a horn runner is sometimes used. Another practice in connection with this trouble is to divide the downgate. The metal is therefore poured into a pouring cup, from whence it is conveyed to a sump near the base of the casting in three or four streams. This method helps to cut down turbulence. Other and more conventional methods of pouring are, of course, used as well, but the practice described is general, especially for larger castings. Occasionally where circumstances require very thorough feeding an additional ingate is arranged for nearer the top of the casting.

In large castings particularly chills are frequently used in the moulds, and great care must be taken to see that condensation or other moisture does not form on these. It is necessary, therefore, to use a good chill dressing, of which there are a number of good proprietary makes on the market. These dressings usually have a self-evaporating base, such as petrol, carbon tetrachloride or methylated spirits, ensuring that a good coating can be applied moisture free.

In the case of the mould and cores a dressing with a water solvent is sometimes used, and in such cases care should be taken by torching or similar means to see that the affected surfaces are quite dry. Sulphur is usually dusted on these surfaces as well.

Melting Pots

Mild steel pots are used for melting magnesium, as there is a tendency for magnesium to react with the silicon in the plumbago type usually used in non-ferrous work. Grey iron pots are not used, as it is found that they also do not stand up to requirements sufficiently well. When these pots are lifted from the furnace great care should be taken to carry them steadily to the mould, and pouring should be carefully controlled. At the commencement of this operation the flux should either be skimmed right off the surface or held back from the lip of the pot, and the exposed surface of metal dusted with flowers of sulphur so as to form some kind of protective cover for the metal in transit. It is wise not to pour the whole of the contents of the pot as the flux, having absorbed magnesium oxide in the washing stage and sunk to the bottom, may accidentally be poured into the mould. It is also important to remember thoroughly to clean out these residuals before re-using the pot, else the accumulated residue will certainly in part find its way into subsequent castings.

Space does not permit of greater details of any one aspect of this subject being dealt with, but it will be understood that the description given here is in the most general terms, and much more could be said in relation to almost every phase touched upon.

THE SECONDARY ALUMINIUM PROBLEM

Early in 1941, it became evident that so-called secondary aluminium must be used in the war effort to supplement the production of new aluminium, writes SAM TOUR, Vice-President, Lucius Pitkin, Inc., New York, in "Steel" in a review of technical progress in 1942. The logical place to use secondary metal was in castings for military equipment. But a survey of government specifications showed such stringent impurity limits that such use was impossible. It was necessary to start a campaign to revise old specifications or issue new ones for aluminium castings and to find out what alloys could be made from the secondary aluminium. Little progress was made in 1941 along either of these lines. Considerable progress has been made in 1942. More progress is possible and 1943 should show further advances.

New permanent and emergency specifications have been adopted by Services. Those of the Army Ordnance Department and some of the Navy Department are clearly a step in the right direction. Certain Navy Department revisions and most Air Service revisions give only lip service to actual needs. There the slight adjustments in certain impurity limits are pure camouflage to cover resistance to use of secondary metal and in effect do not permit the use of such metal. As new information becomes available on the successful applications of secondary aluminium alloys, it is hoped that some of this resistance will disappear.

For the Services and industry to use "secondary" aluminium, they must know what compositions and what quantities of such compositions are available. As all this is under the control of the War Production Board, that agency should supply the information. Although W.P.B. has ruled that secondary aluminium must be used for certain castings, it has failed to gather and supply information as to what constitutes this secondary aluminium. This forces users to go to the individual secondary smelters and get what information they can. All such information is sketchy and temporary because the secondary smelters can only say what they have in sight to-day and have no way of knowing what W.P.B. will do next in connection with routing scrap. In spite of this condition, progress is considerable.

American Steel Castings Prices.—Because steel castings necessary for war have to be delivered by foundries far beyond their normal marketing areas, the American Office of Price Administration has authorised the foundries to add all transportation costs above 50 cents per 100 lbs. to their maximum prices for the castings. Reduction in maximum prices amounting to about 25 per cent. for cast armour hulls and hull sections for tanks, and for some types of cast armour for the Navy, are ordered at the same time. The O.P.A. points out that the reduction in maximum prices makes no difference in actual selling prices, as the action simply freezes at current levels prices now being charged.

A NOVEL IDEA FOR CORRECTLY CORING MACHINE-MADE MOULDS

By G. R. Wilkinson (Fodens, Limited)

It is universally recognised that the moulding-box locating pins are the crucial point for correct location of the top and bottom halves of a mould, and what follows discloses how it is possible to use the same locating pins for setting the core in position. The casting illustrated in Fig. 1 shows an elbow 12 in. long by 3½ in. bore, with a general thickness of ¼ in., excepting the two ends which are increased in thickness to $\frac{7}{16}$ in. These elbows are cast in aluminium alloy.

The moulds are machine-made in the usual way. The top half of the corebox is fitted with pins identical to those on the pattern plate shown in Fig. 2, while the bottom half of the corebox contains pin holes as in the moulding box. A cast core-iron, shown in Fig. 3 and carrying projecting nails bent to the contour of the box, is rammed in the top half of the core; the bottom half of the core does not

(*Concluded on page* 88.)

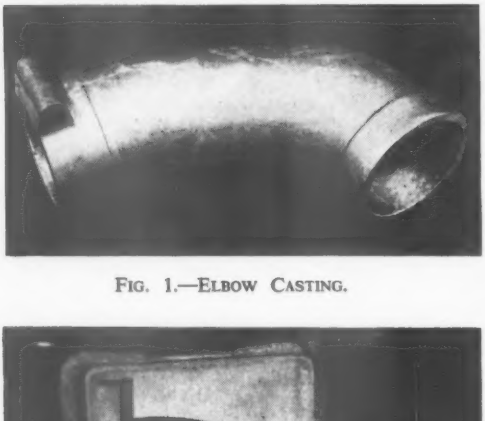


Fig. 1.—Elbow Casting.

Fig. 2.—Corebox and Pattern Plate.

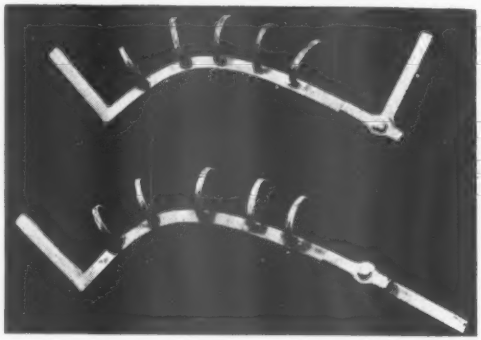


Fig. 3.—Cast Core-Iron.

Fig. 4.—Assembling Mould and Corebox.

BRITISH CAST-IRON RESEARCH ASSOCIATION

OPENING OF NEW LABORATORIES

A distinguished company witnessed the official opening of the handsome and commodious new headquarters and laboratories of the British Cast Iron Research Association on Friday (May 28) by Lord Riverdale of Sheffield, chairman of the Advisory Council to the Department of Scientific and Industrial Research. Scientists, associated with research and leading industrialists, were among the assembly, and many other prominent members of the organisation. On all hands this acquisition of new premises, situated in a delightful spot in Worcestershire, which have been in operation some months, was acclaimed as giving a new impetus to research and as marking a notable stage in the Association's history.

At the luncheon at the Queen's Hotel at Birmingham which preceded the ceremony, the President (Mr. P. Pritchard) extended a welcome to the guests. Lord Riverdale he referred to as one well known for his life-long connection with the metallurgical industry, and for his work on a large number of Commissions and Government Committees. Of Sir Edward Appleton, Secretary to the Department of which Lord Riverdale was Chairman of the Advisory Council, he said he was a distinguished physicist who had done great work on radio development. Lord Dudley was not only Midland Regional Commissioner, but also a past-President, during whose tenure of office the Association began to collect funds for the project which they would presently inspect. Others present included Mr. A. L. Hetherington, who had recently joined the Coal Utilisation Research Association; Mr. Robert Pickard, Director of the British Cotton Industry Research Association; Dr. Desch, Iron and Steel Industrial Research Council; Mr. W. H. Whittle, President of the Institute of Vitreous Enamellers; Mr. G. E. France, President of the Foundry Trades' Equipment and Supplies Association; Dr. S. F. Dorey, Chief Engineer of Lloyds; Mr. R. W. Blount, Board of Education; Prof. D. Hanson, Birmingham University; Mr. FitzHerbert Wright, Chairman of the Council of Foundry Associations; Mr. K. Headlam-Morley, Secretary of the Iron and Steel Institute; Mr. E. C. Evans, Secretary of the Iron and Steel Industrial Research Council; Mr. T. Lee, President of the Manchester and District Ironfounders' Employers Association; Mr. Walter Higgs, M.P., and Mr. V. C. Faulkner (Editor of the "Foundry Trade Journal").

Opening Ceremony

The party with many other members were conveyed to the new headquarters by bus, and here on the terrace the President extended a general welcome to the large company.

LORD RIVERDALE, in declaring the new premises open, said he was delighted to have been invited to take part in that auspicious occasion. It was a great step forward that the Association was making, and he trusted that it would meet with every success. "This Association was one of the earliest of those formed after the last war. Its growth has been slow, but steady, and there was no doubt that it would play its part in assisting the foundry industry to meet its problems of both home and export trades after the war. The future of industry in this country, and in particular the dependence of industry on research, was engaging the attention of the authorities; and there could be no question in their minds of the necessity for extending British research facilities, and means for applying and using science in industry. He thought, therefore, that the Council had acted with wisdom and foresight in arranging to acquire premises forming a nucleus from which much may grow. It stood, in the Prime Minister's famous phrase, at the 'end of a beginning.' The Association had indeed been fortunate in obtaining premises which lent themselves so admirably and with so little adaptation to research purposes. He had had a life-long connection with the steel industry, which did a considerable amount of research work through the Iron and Steel Industrial Research Council. He was gratified at the close co-operation which existed between the Association and the Research Council, because the raw material of the steel industry—pig-iron—was essentially a cast iron, and experience had shown that the problems arising during subsequent processes of refinement were very materially affected by the properties of the raw material."

Stepping inside the hall, his lordship then unveiled two mural tablets, which recorded in permanent form that opening ceremony and their thanks to Mr. Pritchard, who as president had done so much to assist in acquiring the new premises and the grounds around. Each tablet was headed with the title of the Association. One gave the date of opening by Lord Riverdale of Sheffield, with the names of the Executive Committee: Harold Hartley, D.Sc.,; T. M. Herbert, M.A.; J. E. Hurst, D.Met.; A. E. Peace; P. H. Wilson, O.B.E.; J. G. Pearce, Director and Secretary The second records the indebtedness of the Association to Mr. Percy Pritchard for his assistance in the acquisition of the premises as permanent headquarters.

Post-War Problems

THE EARL OF DUDLEY, invited to speak, said he was particularly interested in that ceremony, because it was during his term of office as President of the Association that the scheme for re-housing it was conceived and an appeal for funds launched. Consequently it was a matter of great personal gratification to him that the scheme and the appeal had been brought to such happy fruition. He was quite sure that they were able to give better service if they worked under pleasant conditions; and he looked forward to a substantial improvement and development in the scientific application of cast iron as a result by those who guided the scientific advance of the industry and who would now work amid that gem of Worcestershire scenery. After the war the country would be faced with perhaps the greatest problems, and the most formidable crop of difficulties that British industry had even been called upon to tackle. They had to recapture the world's markets, and to prove again to the world that

B.C.I.R.A. New Laboratories

"what is British is best." It would need the concentrative efforts of the brain power and genius of this country, and it could not be done without the application of scientific development. The laboratory must become the most important part of the workshop, instead of the least important. He believed that those who worked under these permanent and comfortable conditions would remember during their daily toil that they were charged with great responsibilities, for unless Britain was well forward in scientific work in the future—and by that he meant going beyond anything that other countries could do—they would not be in the lead as an industrial nation.

However, they had at least reached such a mark during their four years of war activity that at long last the scientist had been given a fair chance. They had seen such a development in that short time that he felt there was a very bright field for the country ahead. He wished the Association good luck in this really fine home, and wished all its members the best of prosperity in the difficult years which might be in front of them during and after the war.

Applying Results of Research

SIR EDWARD APPLETON, as Secretary to the Department of Scientific and Industrial Research, said that on behalf of the Department he should like to add his congratulations to the Council and members of the Association on this addition to their facilities for research, and he was sure that the Director and his staff were eager to make full use of them. It had frequently been said that while our countrymen had been responsible for many of the most fundamental discoveries in science, we usually permitted other nations to get ahead of us in applying them. That might have been true in the past, but he thought that matters will be different after the war. He had seen perhaps as much as anyone our own scientists in action on the practical problems of wartime, and could safely assert that, when the full story could be told, it would be seen that they could apply their science to practical ends in a manner which could at least match the efforts of any other nation. But science could be harnessed equally for peace as for war, and he ventured to predict that, with the realisation of what science could do fresh in our minds, there would be a great forward movement in the application of science to industrial needs after the war, of which he detected signs already. Such a movement they in the Department were determind to do everything they could to support. From a statement made recently by the Financial Secretary to the Treasury, in Parliament, he thought one could be quite certain that no sound research project would lack adequate financial support from the Government.

But it was not enough to do scientific research. It was necessary that the results should permeate the industry, and be absorbed in practical operations. That was why he commended so warmly the wisdom of the Council in setting up the Education Committee, which had done such notable work in the past. He believed there existed in the British Foundry School exactly the organisation for furthering what he had in mind, and he hoped that its activities would be revived at the earliest possible moment. He also referred to the importance of technical training at higher levels, and particularly to the benefits which might follow the temporary interchange of staff between the Research Association, the Universities, the Department's Stations, and the research laboratories of individual firms. It was the Department's intention to foster this cross-fertilisation process as far as possible.

... conclusion Sir Edward said: Too often one heard people complaining of the inadequacy of the industrial research effort in this country. One could, of course, be spurred on by the thought of what there was still to be done, but he thought that the Association could equally be encouraged by what it had already done. It had a fine record of scientific achievement, to which he was sure the future would bring only additional laurels.

Results Achieved

The PRESIDENT expressed his personal thanks for the signal honour paid him by the erection of a tablet. He felt not a little gratified that it was during his tenure of office that the dream of many years should have matured, and that they now found themselves in these really wonderful premises. But he would also like to add a tribute to the people who had done the work in connection with these new headquarters: their Council, the Sub-Committee which investigated the problem, and last, but not least, their Director and his staff. He would say that it was to them really that their thanks were most due. He would also like to convey his testimony, as one who graduated in the cast-iron industry, to the value which the Association had been to the industry. It had made very considerable headway since its early struggles from 1921 onwards, and he himself felt sure of one thing: that whereas cast iron of the early days was regarded as one of the cruder engineering materials, in the very near future, through the efforts of the Association and the research done, it would be lifted into quite another plane. The cast-iron industry would ultimately have cause to thank the early pioneers in research for the splendid work they had accomplished. (Applause.)

DR. HAROLD HARTLEY (chairman of the Council) said that before they proceeded to an inspection of the new laboratories he was sure it would be the general wish to express to Lord Riverdale their appreciation of the encouragement he had given them in performing the opening ceremony, and to thank him for his felicitous remarks about the Association's research work, in which he had shown a warm interest. Although a famous member of a well-known firm of steel manufacturers—and he (the speaker) believed some steel people did not look too kindly on those concerned with cast iron—they had always felt that in Lord Riverdale the Association had one who took

(*Concluded on page* 101.)

FOUNDRY FUEL ECONOMY

MORE EFFICIENT CONTROL OF CUPOLAS STRESSED

At a recent meeting of the East Anglian Section of the Institute of British Foundrymen, over which Mr. H. H. Shepherd presided, Mr. W. J. Driscoll, B.Sc., the Fuel Officer of the Ironfounding Industry Fuel Committee, opened a discussion on "Fuel Economy and Efficiency in the Iron Foundry."

In the course of his remarks, which were confined to cupola practice, MR. DRISCOLL said the height of the charging door sill above the top of the tuyeres was important, because hot gases escaping up the stack from the top of the charges obviously represent heat, and consequently coke, wasted. An endeavour must therefore be made to extract as much sensible heat as possible from the gases by having a high charging door and, by keeping the furnace full up to the charging door sill, hold sufficient weight of iron in the stock column to absorb the heat. The height of the charging door sill above the tuyeres should be at least 12 ft. on small cupolas, preferably 14 ft., increasing to about 18 ft. or so on large furnaces.

Specific Melting Rate

An important point was the melting rate obtained per sq. ft. of cross-sectional area at the tuyeres. To obtain this figure, of course, one divided the actual overall melting rate obtained in tons per hr. by the cross-sectional area of the furnace at the tuyeres in sq. ft., and one obtained a figure expressed in tons per hr. per sq. ft. This figure was designated the specific melting rate. In calculating the cross-sectional area of the furnace, the actual diameter at the tuyeres of the patched furnace should be used, and not the diameter which the furnace was believed to be. If it was found that in the case of a particular cupola the specific melting rate was about 0.6 tons per hr. per sq. ft., or less, then one might be fairly sure that it was possible to save a certain amount of coke on that furnace. The specific melting rate under good conditions should generally be between about 0.7 and 0.8 tons per hr. per sq. ft. That is, a furnace which was 33 in. dia. at tuyere level, and which therefore had a cross-sectional area of about 6 sq. ft., should melt at a rate of about 4½ tons per hr. When appreciable percentages of steel scrap were being melted it was generally desirable for the specific melting rate to be somewhat lower. To remedy this, the cupola should therefore be lined down to the new diameter, preferably from the baseplate upwards to a level about 3 ft. above the tuyeres. If the reduction in diameter below the tuyeres involved that the well capacity was reduced too much, the reduction need not be made in this part of the furnace. Thus, the new brickwork or patching would only be applied from just below the tuyeres to 3 ft. or so above them. How would this modification affect the overall coke consumption? The reduction in the diameter of the furnace would, of course, reduce the weight of the coke bed for a given height, while it will generally be found also that the higher melting rate obtained per sq. ft. would enable the weight of the coke charges to be reduced for a given weight of iron charge.

Tuyeres

With regard to the number of rows of tuyeres to be used, Mr. Shepherd had indicated in a previous Paper that he believed that two rows of properly designed and positioned tuyeres would usually give better results than one row. In general, where two rows of tuyeres were used, the upper row was not properly designed and positioned, and that, rather than improving the overall efficiency of the furnace, the upper row would tend to detract from it. In the Balanced Blast and Poumay systems, of course, with multiple rows of tuyeres, and in which the air supplied to the lower and upper rows would be finely balanced to give more complete combustion of the coke, the efficiency would, of course, be high, but in the case of most cupolas with two rows of tuyeres, the upper row could profitably be stopped off completely, the tuyere area in the bottom row being increased if necessary. This alteration resulted in a decreased weight of coke bed for a given height above the tuyeres, and also increased the amount of pre-heating space available in the stock column.

Coke Depreciation through Storage

MR. H. H. SHEPHERD said the ideal condition was to store under cover because storage of coke in exposed positions to all sorts of weather for considerable periods of time, especially during the winter months, would result in serious deterioration. Some authorities were only prepared to admit that the sole deterioration was a small increase in the proportion of small breeze and dust, and a corresponding decrease in the amount of coke which could be used in the furnace. He had used coke which had been stored for as long as 18 months, or perhaps more. This coke when used in the same amounts per metal charge as comparatively recent delivered material, gave serious periods of dull iron, and it was only by increasing the amount of coke per charge very considerably that the trouble was eliminated, but it resulted in an appreciably increased sulphur content in the metal.

Close examination as to possible reasons for the trouble indicated that though the coke was of fair size when it was put on the furnace it rapidly broke up and much of it blew out of the slag hole in small pieces, and the speaker was thus led to the opinion that long storage set up fractures, cracks, or fissures and therefore coke was intrinsically weakened physically and consequently broke up under the weight of the metal charges and the effects of heat in the cupolas.

High Carbon Pick-up

In cases where one had to maintain a reasonably standard total carbon content, high carbon pick-up might be necessary, as for example in cases where a fairly high total carbon was necessary and this would lead to increased coke consumption. There was, however, a point that might be noted in connection with this, if the metal was required to comply with certain

Foundry Fuel Economy

total carbon contents and it was found that for some reason or other the total carbon was decreasing, it was inadvisable to adopt the practice of adding much more coke, for whilst this might be necessary to overcome a particular batch of trouble on a particular day, it would be found that invariably it would not cure the problem. This was especially the case where the drop in total carbon was due to varying coke quality. The correct way is to reduce the air volume, taking care, of course, that the reduction is not sufficient seriously to affect the metal temperature. If it was impossible to eliminate the trouble by reduction in air volume without bringing in other difficulties, and the cupola had two or three rows of tuyeres, shutting off the topmost row might be tried.

The Blowing Down Period

In many cases more damage was done to the cupola lining during the blowing down period than probably throughout the whole of the melt. When the bottom was dropped, or in the case of solid bottom cupolas, the bed coke, etc., was raked out, the drop should be quenched thoroughly with an adequate supply of water and furnacemen should be instructed to see that quenching was carried out in such a way that there was no risk of the coke re-kindling.

The mixture of drop coke, slag, etc., well paid for thorough hand-picking of the coke out of it, as this coke was quite suitable to replace new coke on the charges since it did not suffer in any way. As some of it might be perhaps on the small side the best plan was to mix this coke with the new coke.

MR. T. W. RUFFLE supported Mr. Shepherd's remarks as to the deterioration of coke which had been stored for some time. He found that in firing high-temperature ovens with stored coke, the temperature could not be obtained, and he was of the opinion that a definite research into the cause of this deterioration would be extremely useful. He referred to a recent statement by the Minister of Fuel, on the tendency in factories for lights to be left on and small machines left running, during breaks. Not only was the direct wastage of fuel here of importance, but the psychological effect on the workers as far as economy in the home was concerned should be borne in mind.

MR. G. NEWMAN asked Mr. Shepherd on what grounds he based his statement, that coke "drop" was as good as new coke.

MR. SHEPHERD, in reply, said mostly as a result of experience and by close examination of the coke, which shows very little depth of burnt surface. Moreover a good proportion of the "drop" was relatively new coke, added with the last few charges, and although 100 per cent. was perhaps a slight exaggeration, for practical purposes the "drop" could be treated as good as new.

Reduced Soaking Periods

MR. L. E. SLATER was of the opinion that "blowing" immediately after charging the cupola would give a good saving in fuel, as any lengthy time elapsing between charging and blowing necessitated the attendance of a cupola man during that period, with a consequent waste of lighting, etc.

MR. SHEPHERD agreed, in general, that the time taken from start of charging to charging door level was sufficient for any desired "soaking."

Core Baking

MR. N. PEMBERTON said the discussion so far had dealt mainly with fuel economy in cupola practice. There were, however, other fuel-consuming units in the foundry where much fuel could be saved. Core-baking ovens were an instance, and serve as an example covering a very wide field. In all ovens of this type, and in most furnaces and boilers, enormous quantities of fuel have been needlessly wasted. It was his experience that the chief cause of the waste was due to an excess of air used for combustion. It was of primary importance that only just sufficient air should be admitted, so that the fuel, whether coke, coal or oil, should be completely burned. Enough air must be admitted, however, to clear all black smoke from the chimney top. It was commonly thought that the chimney top should be quite clear, but this was most decidedly not the case. There should be a clearly visible haze. Should any air over that required to give this condition be admitted, a corresponding increase of fuel consumption would result, and efficiency would be lowered. All ovens and furnaces should be equipped with dampers which really work, and these should be kept as far towards the closed position as possible. When oven doors are opened, dampers should be shut to retain the heat in the oven, and all brickwork should be in good condition, so that unwanted air did not leak in. The ovens should, of course, be fully loaded as far as possible before a heat was started. It is a good plan to put up posters setting out these points, so that the man operating the oven has a continual reminder before him. Graphs showing weekly consumption of fuel at ovens, etc., were very useful, and provided an incentive to the attendant, particularly if the weekly consumption over the previous year was shown.

MR. V. W. CHILD said that, whilst desirable, it was not always possible to have the slag hole closed when "blowing," but it should be kept small. A hole 2 in. in diameter he found was sufficient, and saved loss of coke and excess air. Referring to the use of "drop" coke, he recommended employing a labourer to inspect daily the coke and slag, and adding the good coke to the charging bins.

MR. DRISCOLL thanked the meeting for the interest they had shown and for the excellent discussion which had ensued. He agreed with Mr. Pemberton that there was probably a higher percentage saving possible in stoves, etc., than in cupolas. Managements could help by appointing fuel officers on their works, and a woman or girl would answer the purpose, as co-operation rather than authority was the end sought.

Finally a vote of thanks was proposed to Mr. Driscoll by MR. F. E. TIBBENHAM, to which the meeting cordially responded.

BRITISH CAST-IRON RESEARCH ASSOCIATION

(*Concluded from page* 98.)

a real interest in their activities. The Association had been very fortunate in its presidents, and Lord Dudley had as one of them left an impression of a very vigorous personality, so that they were extremely glad that he had been able to attend and see the development which had been initiated during his presidential period. Then also the presence of Sir Edward Appleton lent support to their claim to be a Research Association which did not concern itself only with development, for it did endeavour to play its part in carrying out fundamental research. It realised that only by doing this could they settle upon new factors which were required, and without which there could be no further development. They must look to the universities and these centres of research for the greater part of this work, and the Council of the Association and the Director felt very strongly that they would not be fulfilling their obligations to their subscribers unless they undertook fundamental research. Concluding, Dr. Hartley thanked various public undertakings and the local authority's officers for their help, and said Mr. J. F. Cook had been of especial service in effecting the removal so smoothly. Their Director had been responsible for the running of the Association almost since its inception. Mr. Pearce regarded that day as a big milestone in their progress, and looked forward with every confidence to a considerable extension of the work of this group, which depended so much on his personal enthusiasm. He (Dr. Hartley) was sure they would desire him to congratulate Mr. Pearce on the success which had been achieved so far, and to convey to him their very good wishes for the future. (Applause.)

After the tour of inspection tea was served in a marquee and ended a fine summer day.

PERSONAL

WING-COMMANDER J. B. R. BROOKE has joined the board of John Lysaght, Limited, and took up an appointment as general manager of the Normanby Park Steelworks, Scunthorpe, on June 1. His father, Mr. W. J. Brooke, retires from his post as managing director at the end of the current year.

MR. PATRICK ASHLEY COOPER, DR. C. C. GARRARD and MR. G. CHELIOTI have joined the board of the General Electric Company, Limited. Mr. P. Ashley Cooper is a director of the Bank of England and a member of the London Passenger Transport Board, among other interests. Dr. Garrard is joint general manager of the G.E.C. engineering works at Birmingham, while Mr. Chelioti is manager of the Osram factories in the G.E.C. group.

Will

BATTYE, ARTHUR, Holmfirth, Yorks, a director of W. W. Battye & Sons, Limited, Victoria Iron Works, Holmfirth £6,687

EXPORT LICENSING CHANGES

Under the Export of Goods (Control) (No. 5) Order, 1943 (S.R. & O. No. 650), which came into force on May 24, licences will, in future, be required to export the following classes of goods to all destinations:

Boilers (steam) and boiler furnaces; fuel economisers; pre-heaters; superheaters and de-superheaters; mechanical stokers; and metal parts and accessories for the foregoing. Driers of the kinds used for drying grain, grass or other agricultural or horticultural produce; and parts thereof wholly or mainly of metal. Injectors and ejectors, fluid, wholly or mainly of metal. Machinery and plant of the kinds used in the processes of leather manufacture.

The existing licensing requirements with respect to (*a*) crucibles, plumbago; (*b*) agricultural machinery, flax-pulling machinery, and lawn mowers and other grass-cutting machines; (*c*) machinery of the kinds used for agitating, crushing, grinding, mixing, separating, screening, sifting, sorting or washing mineral products; and (*d*) creosote, wood, are superseded by the provisions that licences will, in future, be required to export the following:

(*a*) Crucibles wholly or partly of graphite; (*b*) agricultural and horticultural machinery and implements, and parts thereof; wholly or mainly of metal; (*c*) crushing, grinding, mincing, pulverising and shredding machinery, not specified elsewhere in the schedule of controlled goods; and parts thereof wholly or mainly of metal; machinery of the kinds used for agitating, separating, screening, sifting, sorting or washing mineral products; and mixing machines and parts thereof wholly or mainly of metal; (*d*) creosote, wood, and mixtures consisting mainly of wood creosote.

SCRAP METAL DUMPS

BRIGADIER-GENERAL CLIFTON BROWN asked the Parliamentary Secretary to the Ministry of Works whether he would take steps to clear up the dumps of scrap in country villages before he proceeded with further requisitions from private owners.

MR. HICKS replied that systematic arrangements were in operation for the clearance of village dumps, though it must necessarily take a considerable time to cover the whole of the rural areas. These dumps yielded a high proportion of very light scrap, and there was a marked deficiency of heavier material which it was necessary to meet from other sources, including requisitions from private owners.

BRIGADIER-GENERAL BROWN said that people all over the country were tired of seeing these big heaps, which they had patriotically helped to put there, while their railings were taken away without due notice having been given. Why not have regular collections?

MR. HICKS said that whenever there had been a county drive for scrap metal every dump had been systematically cleared.

NEWS IN BRIEF

THE MEDICAL RESEARCH COUNCIL is to establish at London Hospital a department for research in industrial medicine.

REDUCTION OF THE CAPITAL of the Ince Forge Company, Limited, from £60,000 to £31,500 has been confirmed by the Court.

UP TO MARCH 31 LAST the cost of collection of scrap metal, handled directly by the Ministry of Works, was £1,796,000. Its value, at controlled prices, is estimated at £1,948,000.

THE EMPLOYEES of Colvilles, Limited, and allied companies have contributed £842 for the purchase of a mobile canteen for service with the Eighth Army, in which are many former employees of the works.

THE LONDON OFFICES of the Cookson Lead & Antimony Company, Limited, Locke, Lancaster & W. W. & R. Johnson & Sons, Limited, Oidas Metals Company, Limited, and Walkers, Parker & Company, Limited, are now at 17, Waterloo Place, London, S.W.1.

LISTENERS WERE TOLD how steel is made on the Home Service radio last week in a 25 minutes' conversation between five of the staff of the English Steel Corporation, Limited. Taking part in the broadcast were Mr. C. H. Dolphin, publicity manager; Mr. J. E. G. Gilfillan, superintendent of forge and machine shops and general engineering; Mr. F. Perry, first hand melter; Mr. H. Renshaw, leading forgeman; and Mr. Eric W. Smith, senior process metallurgist.

THE BOARD OF TRADE have, with the approval of the Treasury, decided that, in respect of the period beginning June 3, 1943, and ending September 2, 1943, the rate of premium payable under any policy issued under the Commodity Insurance Scheme shall continue to be at the rate of 2s. 6d. per cent. per month. The monthly and three-monthly policies for a fixed sum and three-monthly adjustable policies previously issued will be continued.

THE EARL OF VERULAM, chairman of the Enfield Rolling Mills, Limited, comments in a statement circulated with the report and accounts on the equipment of the new subsidiary for refining aluminium. This new subsidiary has exceeded their most optimistic expectations, and has made a most valuable contribution to the war effort, he says. Their success in expanding their capacity for refining aluminium has been fully recognised by the Light Metals Control.

SIR WALTER LAYTON resigned as from the end of May, at his own request, from the position of Chief Adviser on Programmes and Planning and head of the Joint War Production Staff. He will be succeeded by Sir Robert Sinclair, who will, in addition, become chief executive of the Ministry of Production. Sir Robert has been Minister's deputy and representative on the Combined Production and Resources Board in Washington since July, 1942. Sir Henry Self will succeed Sir Robert in Washington. Mr. J. H. E. Woods, of the Treasury, will succeed Sir Henry Self as Permanent Secretary to the Ministry of Production.

PRE-FABRICATION AND RIVETERS' EARNINGS

Loss of work and earnings by riveters, caulkers, and other members of the Boilermakers' Society as a result of the extension of pre-fabrication and welding methods in shipbuilding were among the problems discussed at a conference in Glasgow of boilermaker shop stewards. Mr. J. Morrison, chairman, said that unless they altered their existing organisation and prepared for the changes now taking place in the industry, it might be said that boilermakers would cease to exist as craftsmen, but would become semi-skilled workers with a semi-skilled standard of living.

In the discussion it was urged that, where a caulker, riveter, or plater did not have sufficient work, he should be allowed to train as a welder and do pre-fabrication work.

A resolution was adopted calling for a revision of price-lists, with continuance of the piece-work system, but with a guaranteed minimum. It was also demanded that members of the Society should be free to undertake any work in the boilermaker trades.

WORKMEN'S COMPENSATION FOR DISABLEMENT

Under the Workmen's Compensation Act, 1925, a certificate of disablement in respect of a scheduled disease can only be obtained from the examining surgeon for the district in which a workman is employed. In present circumstances, owing to many workmen being directed into work sometimes long distances from their homes, hardship may result in cases where a workman contracts a scheduled disease and returns home or is removed for medical treatment to a hospital or other place outside the district in which he was employed before getting the examining surgeon's certificate. To meet this difficulty the Home Secretary has issued a direction under Section 7 of the Workmen's Compensation Act, 1943, by which, in such cases, the powers and duties under the act of the examining surgeon for the district in which a workman is employed may be exercised and performed by the examining surgeon for the district where the workman resides or to which he has been removed for medical treatment.

IN A STATEMENT accompanying the report and accounts of Newton Chambers & Company, Limited, Sir Samuel Roberts, Bt., chairman, records that during the year the blast-furnace lining broke down prematurely, due to the many operating difficulties experienced since the war. After a careful review of all the circumstances, it was decided in the best interests of the company not to re-line it, but, with the consent of the Government department concerned, to dismantle it. For some time past the blast furnace has not been a paying proposition, says the chairman, and the directors did not feel justified in putting more capital into it.

STANTON DALE

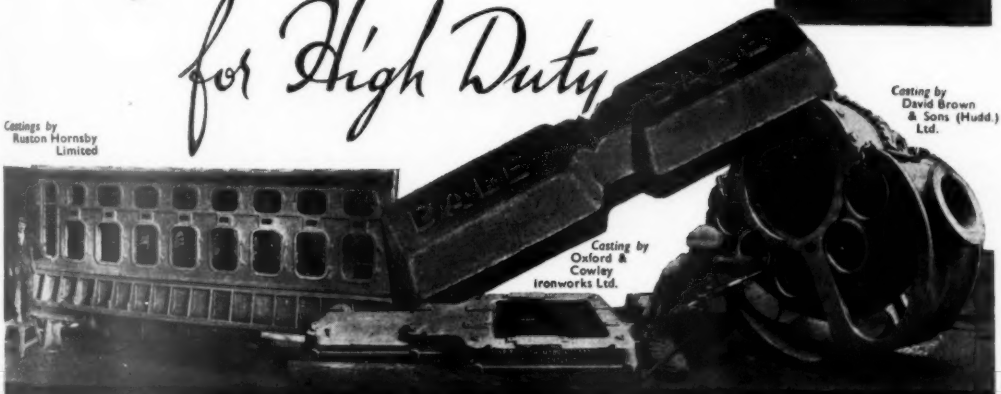
Refined PIG IRON

for High Duty

Castings by Morris Motors Limited.

Casting by Baker Perkins Limited

Castings by Ruston Hornsby Limited



Castings by Ruston Hornsby Limited

Casting by David Brown & Sons (Hudd.) Ltd.

Casting by Oxford & Cowley Ironworks Ltd.

THE STANTON IRONWORKS COMPANY LIMITED
NEAR NOTTINGHAM.

COMPANY NEWS

(Figures for previous year in brackets.)

British Timken—Dividend of 15% (same).

National Electric Construction—Dividend of 10%.

North British Locomotive Company—Dividend on the ordinary shares of 3% (nil).

R. A. Lister & Company—Interim dividend of 5% on the ordinary shares (same).

Associated British Engineering—Dividend of 6% (5%) for the year ended March 31.

Wilkes Berger Engineering—Dividend of 15% and a bonus of 2½% (nil) on the ordinary shares.

Newall Engineering—Final dividend of 7% (same), making 12% on the "A" ordinary shares (same).

Brooks & Doxey (Holdings)—Net profit to March 31 last, £1,337 (£3,734); debit forward, £195,681 (£197,018).

Goodlass Wall & Lead Industries—Dividend of 6% (same), plus a bonus of 1% (nil) on the ordinary shares.

Penarth Pontoon Slipway & Ship-Repairing—Net profit for 1942, £3,763 (£708); ordinary dividend of 5% (nil).

B. Finch & Company—Net profit for 1942, before tax, £17,361 (£4,731); ordinary dividend of 6% (nil); forward, £4,025 (£3,232).

Skefko Ball Bearing Company—Net profit for 1942, £176,195 (£170,599); dividend of 17½%, tax free (same), £140,000; forward, £137,047 (£150,852).

Newton, Chambers & Company—Profit for 1942, £205,726 (£238,376); net profit, £78,849 (£73,606); to notes repayment reserve, £30,000 (same); final dividends on the participating preference shares and ordinary shares of 10%, making 15% (same); forward, £104,002 (£101,122).

Walsall Conduits—Trading profit for 1942, £213,152 (£202,432); war risk insurance, A.R.P. expenditure, etc., £10,107 (£12,288); provision for tax, £133,612 (£112,925); to reserve, £20,000 (same); ordinary dividend of 55%, £41,250 (same); preference dividend, £5,000; forward, £86,195 (£83,312).

C. & W. Walker—Profit to January 31 last, after depreciation and income-tax for the year, £19,302 (£21,649); dividend on the preference shares of 7½%, £1,500; ordinary dividend of 10% (same), £4,765; bonus on the ordinary shares of 1s. per share (same), £2,382; N.D.C., £900; provision for income tax, 1943/44, £9,100; forward, £15,276.

Kitchen & Wade—Net profit for the year to March 31, 1942, £113,733 (£107,106), subject to price repayments, income-tax and E.P.T. amounting together to £83,332 (£78,641); available, £31,923 (£30,428); to reserve, £5,000 (same); cash bonus of 5%, making with the dividends paid a total distribution of 30% (same); forward, £4,423 (£1,522).

Garrard Engineering & Manufacturing—Net profit for the year ended January 31, 1943, after making provision for depreciation, taxation, etc., £20,964 (£21,149); final dividend of 5% on the preferred ordinary shares, making 10% (same); to plant and machinery reserve, £4,600; final dividend on the ordinary shares of 1½d. per share, making 3d. (same); forward, £21,522 (£17,033).

RECRUITMENT OF ENGINEERS

Government departments' replies to recommendations made by the Select Committee on National Expenditure are contained in a report which has been issued as a White Paper.

The Ministry of Labour and National Service, replying to a recommendation that steps should be taken to ensure disciplinary action against workmen for misconduct or absenteeism as speedily as possible, agrees that where cases are reported the necessary action should be rapid. Improvements in the procedure had been made, with satisfactory results.

Replies are also made to two recommendations of the committee concerning recruitment:—(1) That in engineering appointments arrangements should be made to ensure that academic qualifications are not allowed to overshadow the less easily accessible, but great practical, value of men who have graduated through the workshops to management level; and (2) that to meet the shortage of persons of managerial capacity the Ministry of Labour should make a careful search for persons who might be upgraded above the level of their present employment.

The Treasury states that it has consulted the Ministry of Labour, and understands that the Department is fully alive to the importance of the point raised by the committee. The Ministry is much concerned with the problem of the upgrading of labour, and through the Labour Supply and National Service Departments brings effective pressure upon employers of engineering labour to secure it.

OBITUARY

MR. THOMAS THOMPSON, secretary of the Sunderland Forge & Engineering Company, Limited, died on May 24, aged 45.

MR. ROBERT BARBOUR, who was for many years associated with the Summerlee Iron Company, Limited, died recently at Greenock.

MR. E. J. HALLMARK, who died recently, served as Midland representative of Stewarts and Lloyds, Limited, for thirty years. Owing to ill-health, he retired from the firm at the end of last year.

MR. H. F. MAXWELL, of Stewarts and Lloyds, Limited, London, died recently. Mr. Maxwell joined the company in 1916 and was manager of the Country Department domiciled at Winchester House. During the last war he fought in the London Scottish.

CONTRACT OPEN

The date given is the latest on which tenders will be accepted. The address is that from which tender forms may be obtained.

Birkenhead, June 9—Wrought-iron tubes and fittings; cast-iron pipes and specials; brasswork gas and meter fittings; tools, bolts and nuts, iron and steel; gas meters; tinware, etc., for the year commencing July 1, for the Town Council. The Gas Engineer, Gas Offices, Hind Street, Birkenhead.

MINISTRY OF SUPPLY

RUBBER IS SCARCE

DON'T

DON'T DRIVE TOO FAST

The faster you drive the more rubber you waste. Speed develops heat. Heat is rubber's greatest enemy.

DON'T

DON'T STAMP ON THE ACCELERATOR

Fierce acceleration tears more rubber off a tyre in a few yards than is worn away by miles of normal driving.

DON'T

DON'T JAM ON YOUR BRAKES

Fierce braking slices rubber off tyres. Check your brakes and have them adjusted regularly. An eccentric brake drum causes excessive tyre wear.

DO

everything you can to conserve your tyres: return them in a fit state for retreading: and thus help to save rubber.

SUBMIT TYRES FOR REPLACEMENT WHEN SMOOTH

Raw Material Markets

IRON AND STEEL

Abundant supplies of high-phosphorus iron are available, and use of these grades has been widely extended in the foundries owing to the meagre tonnages of low-phosphorus and hematite iron which are available. For this reason there has been quite a run on refined iron in the engineering and allied foundry trades. The second period of the year is approaching its end and most of the foundries have already been given their allocations for Period III. Heavy engineering works and allied industries are in possession of full order-books for a long time ahead, most of their commitments being in respect of needs of various Government departments. While the position of the light-foundry trade is still improving, this branch is far from being fully engaged.

While there has been no relaxation of the pressure for steel semis and producers are being urged to maintain maximum deliveries, the immediate anxieties of re-rollers in regard to supplies seem to have been relieved. Substantial tonnages are coming to hand and it would appear that the Control are in a position to provide such additional tonnages of imported material as may be necessary to keep the re-rolling mills in full operation. This is all the more necessary since these mills are now engaged almost exclusively on Government contracts and are turning out substantial quantities of thin plates, light sections, etc.

Although the galvanising shops are idle, there is a big demand for black and painted sheets and a further spate of orders is expected as soon as present commitments are overtaken. Shipbuilders' specifications loom largely on the rolling programmes of the plate and section mills, and the amount of pre-fabricated material steadily increases. Requirements of tank, locomotive and boiler makers are also on a very high scale, and structural engineers are also pressing for light and medium joists, channels, tees, etc.

NON-FERROUS METALS

The announcement that a new contract had been concluded between the Chilean Government and the U.S. Metals Reserve Company, under which the U.S. Government has agreed to raise its prices for Chilean copper, occasioned no surprise in copper circles. For refined copper the increase in price amounts to 5 per cent. and for copper shipped in the form of ore it is 10 per cent. In both cases the increase will be operative as from February 1 last and will remain in force until the end of July, 1944. Since February, 1942, all supplies of Chilean copper have been sold to the U.S. Government. This agreement was to last for 18 months and the fact that the new prices are to run until the end of July of next year indicates that the agreement has been extended by at least twelve months. The new price for Chilean copper ore has not been divulged, but in February, 1942, the American Government agreed to pay 11.25 cents per lb. for refined copper; this price was raised by 10 per cent. in August last, so that the new addition of 5 per cent. brings this price up to nearly 13 cents per lb.

Valuable assistance to Bolivian tin producers is being given by the U.S. Board of Economic Warfare. Financial help is being supplied to certain producers, while the Board has offered to furnish technical advice to mines seeking it. The services of the Board's staff of mining and metallurgical engineers have been tendered. Assistance is being granted in other directions also; the Board is willing to procure priority certificates for the supply and shipment to Bolivia of mining equipment. Some tin deposits have already been sampled, and it is stated that the prospects of enlarging outputs are encouraging. Output of the small tin mines in Bolivia improved during 1942, and it is believed that the current year will witness a maintenance of the present rate of exploitation and exportation.

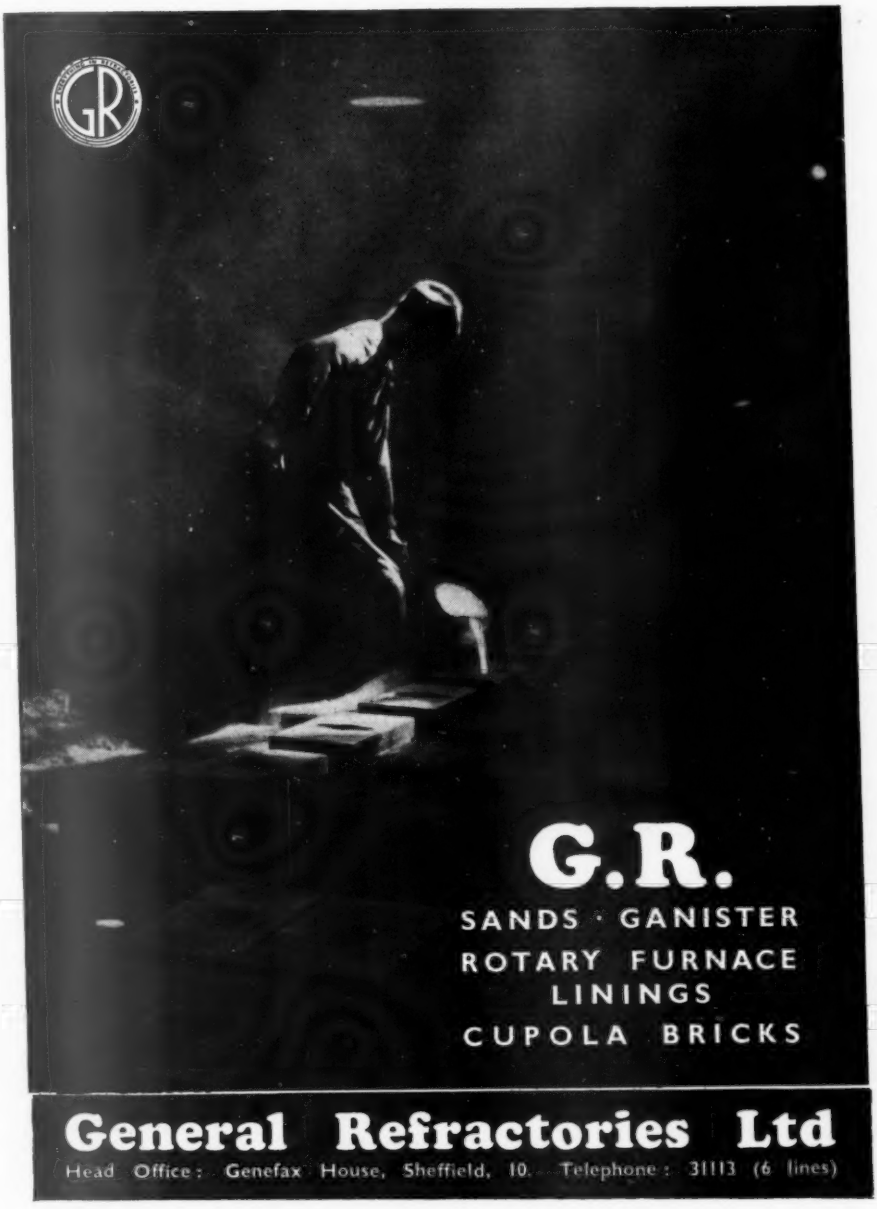
In spelter, as in most other non-ferrous metals, there is strict control over distribution, the authorities meaning what they say when they indicate that non-essential uses of the metal have to be eliminated. Although any easing of the shipping situation in the Mediterranean should facilitate the despatch of larger tonnages of zinc and zinc ore from Australia, the Control are unlikely to permit any relaxation in existing methods of distribution, owing to the need to conserve shipping space for even more vital cargoes.

The lead position changes but little from week to week; while supplies are ample to satisfy really urgent needs, the situation does not justify the slightest unnecessary use of the metal, and the authorities are making every provision against wastage.

Robt. Stephenson & Hawthorns—Dividend of 5% (same).

Weyburn Engineering—Interim dividend of 7½% (same) on the ordinary shares.

Webcoline!
The LEADER of ROTARY FURNACE Refractory Linings
WRITE FOR PRICE AND FULL PARTICULARS.
WEBSTER & Co. (Sheffield), Ltd., Millhouses, Sheffield 8.
MAKERS OF HIGH GRADE REFRACTORIES. Telephone: Sheffield 71071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Head Office: Genefax House, Sheffield, 10. Telephone: 31113 (6 lines)

GP 171

CURRENT PRICES OF IRON, STEEL AND NON-FERROUS METALS

(Delivered, unless otherwise stated)

Wednesday, June 2, 1943

PIG-IRON

Foundry Iron.—CLEVELAND No. 3: Middlesbrough, 128s.; Birmingham, 130s.; Falkirk, 128s.; Glasgow, 131s.; Manchester, 133s. DERBYSHIRE No. 3: Birmingham, 130s.; Manchester, 133s.; Sheffield, 127s. 6d. NORTHANTS No. 3: Birmingham, 127s. 6d.; Manchester, 131s. 6d. STAFFS No. 3: Birmingham, 130s.; Manchester, 133s. LINCOLNSHIRE No. 3: Sheffield, 127s. 6d.; Birmingham, 130s.

(*No. 1 foundry 3s. above No. 3. No. 4 forge 1s. below No. 3 for foundries, 3s. below for ironworks.*)

Hematite.—No. 1 (S & P 0.03 to 0.05 per cent.): Scotland, N.-E. Coast and West Coast of England, 138s. 6d.; Sheffield, 144s.; Birmingham, 150s.; Wales (Welsh iron), 134s. East Coast No. 3 at Birmingham, 149s.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, 140s. 6d., delivered Birmingham.

Scotch Iron.—No. 3 foundry, 124s. 9d.; No. 1 foundry 127s. 3d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, 174s.; South Zone, 176s. 6d.

Refined Malleable.—North Zone, 184s.; South Zone, 186s. 6d.

Cold Blast.—South Staffs, 227s. 6d.

(NOTE.—*Prices of hematite pig-iron, and of foundry and forge iron with a phosphoric content of not less than 0.75 per cent., are subject to a rebate of 5s. per ton.*)

FERRO-ALLOYS

(*Per ton unless otherwise stated, basis 2-ton lots, d/d Sheffield works.*)

Ferro-silicon (5-ton lots): 25 per cent., £21 5s.; 45 per cent., £23 10s.; 75 per cent., £36 10s.

Ferro-vanadium.—35/50 per cent., 15s. 6d. per lb. of V.

Ferro-molybdenum.—70/75 per cent., carbon-free, 6s. per lb. of Mo.

Ferro-titanium.—20/25 per cent., carbon-free, 1s. 3½d. lb.

Ferro-tungsten.—80/85 per cent., 9s. 8d. lb.

Tungsten Metal Powder.—98/99 per cent., 9s. 9½d. lb.

Ferro-chrome.—4/6 per cent. C, £44; max. 2 per cent. C, 1s. 0½d. lb.; max. 1 per cent. C, 1s. 1½d. lb.; max. 0.5 per cent. C, 1s. 1¾d. lb.

Cobalt.—98/99 per cent., 8s. 9d. lb.

Metallic Chromium.—96/98 per cent., 4s. 5d. lb.

Ferro-manganese.—78/98 per cent., £18 10s.

Metallic Manganese.—94/96 per cent., carb.-free, 1s. 9d. lb.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms and Slabs.—BASIC: Soft, u.t., 100-ton lots, £12 5s.; tested, up to 0.25 per cent. C, £12 10s.; hard (0.42 to 0.60 per cent. C), £13 17s. 6d.; silico-manganese, £17 5s.; free-cutting, £14 10s. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £15 15s.; case-hardening, £16 12s. 6d.; silico-manganese, £17 5s.

Billets, Blooms and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £13 17s. 6d.; basic hard, 0.42 to 0.60 per cent. C, £14 10s. 6d.; acid, up to 0.25 per cent. C, £16 5s.

Sheet and Tinplate Bars.—£12 2s. 6d., 6-ton lots.

FINISHED STEEL

[*A rebate of 15s. per ton for steel bars, sections, plates, joists and hoops is obtainable in the home trade under certain conditions.*]

Plates and Sections.—Plates, ship (N.-E. Coast), £16 3s.; boiler plates (N.-E. Coast), £17 0s. 6d.; chequer plates (N.-E. Coast), £17 13s.; angles, over 4 un. ins., £15 8s.; tees, over 4 un. ins., £16 8s.; joists, 3 in. × 3 in. and up, £15 8s.

Bars, Sheets, etc.—Rounds and squares, 3 in. to 5½ in., £16 18s.; rounds, under 3 in. to ¼ in. (untested), £17 12s.; flats, over 5 in. wide, £15 13s.; flats, 5 in. wide and under, £17 12s.; rails, heavy, f.o.t., £14 10s. 6d.; hoops, £18 7s.; black sheets, 24 g. (4-ton lots), £22 15s.; galvanised corrugated sheets (4-ton lots), £26 2s. 6d.; galvanised fencing wire, 8g. plain, £26 17s. 6d.

Tinplates.—I.C. cokes, 20 × 14 per box, 29s. 9d., f.o.t. makers' works, 30s. 9d., f.o.b.; C.W., 20×14, 27s. 9d., f.o.t., 28s. 6d., f.o.b.

NON-FERROUS METALS

Copper.—Electrolytic, £62; high-grade fire-refined, £61 10s.; fire-refined of not less than 99.7 per cent., £61; ditto, 99.2 per cent., £60 10s.; black hot-rolled wire rods, £65 10s.

Tin.—99 to under 99.75 per cent., £275; 99.75 to under 99.9 per cent., £276 10s.; min. 99.9 per cent., £278 10s.

Spelter.—G.O.B. (foreign) (duty paid), £25 15s.; ditto (domestic), £26 10s.; "Prime Western," £26 10s.; refined and electrolytic, £27 5s.; not less than 99.99 per cent., £28 15s.

Lead.—Good soft pig-lead (foreign) (duty paid), £25; ditto (Empire and domestic), £25; English, £26 10s.

Zinc Sheets, etc.—Sheets, 10g. and thicker, ex works, £37 12s. 6d.; rolled zinc (boiler plates), ex works, £35 12s. 6d.; zinc oxide (Red Seal), d/d buyers' premises, £30 10s.

Other Metals.—Aluminium, ingots, £110; antimony, English, 99 per cent., £120; quicksilver, ex warehouse, £68 10s. to £69 15s.; nickel, £190 to £195.

Brass.—Solid-drawn tubes, 14d. per lb.; brazed tubes, 16d.; rods, drawn, 11½d.; rods, extruded or rolled, 9d.; sheets to 10 w.g., 10½d.; wire, 10½d.; rolled metal, 10½d.; yellow metal rods, 9d.

Copper Tubes, etc.—Solid-drawn tubes, 15½d. per lb.; brazed tubes, 15½d.; wire, 10d.

Phosphor Bronze.—Strip, 13½d. per lb., sheets to 10 w.g., 14½d.; wire, 16d.; rods, 16d.; tubes, 21½d.; castings, 19d., delivery 3 cwt. free. 10 per cent. phos. cop. £35 above B.S.; 15 per cent. phos. cop. £43 above B.S.; phosphor tin (5 per cent.) £40 above price of English ingots. (C. CLIFFORD & SON, LIMITED.)

Nickel Silver, etc.—Ingots for raising, 10d. to 1s. 4d. per lb.; rolled to 9 in. wide, 1s. 4d. to 1s. 10d.; to 12 in. wide, 1s. 4½d. to 1s. 10½d.; to 15 in. wide, 1s. 4½d. to 1s. 10½d.; to 18 in. wide, 1s. 5d. to 1s. 11d.; to 21 in. wide, 1s. 5½d. to 1s. 11½d.; to 25 in. wide, 1s. 6d. to 2s. Ingots for spoons and forks, 10d. to 1s. 6½d. Ingots rolled to spoon size, 1s. 1d. to 1s. 9½d. Wire round, to 10g., 1s. 7½d. to 2s. 2½d., with extras according to gauge. Special 5ths quality turning rods in straight lengths, 1s. 6½d. upwards.

NON-FERROUS SCRAP

Controlled Maximum Prices.—Bright untinned copper wire, in crucible form or in hanks, £57 10s.; No. 1 copper wire, £57; No. 2 copper wire, £55 10s.; copper firebox plates, cut up, £57 10s.; clean untinned copper, cut up, £56 10s.; braziery copper, £53 10s.; Q.F. process and shell-case brass, 70/30 quality, free from primers, £49; clean fired 303 S.A. cartridge cases, £47; 70/30 turnings, clean and baled, £43; brass swarf, clean, free from iron and commercially dry, £34 10s.; new brass rod ends, 60/40 quality, £38 10s.; hot stampings and fuse metal, 60/40 quality, £38 10s.; Admiralty gunmetal, 88-10-2, containing not more than ½ per cent. lead or 3 per cent. zinc, or less than 9½ per cent. tin, £74 10s., all per ton. ex works.

Returned Process Scrap.—(Issued by the N.F.M.C. as the basis of settlement for returned process scrap, week ended May 29 where buyer and seller have not mutually agreed a price; net, per ton, ex-sellers' works, suitably packed):—

BRASS.—S.A.A. webbing, £48 10s.; S.A.A. defective cups and cases, £47 10s.; S.A.A. cut-offs and trimmings, £42 10s.; S.A.A. turnings (loose), £37; S.A.A. turnings (baled), £42 10s.; S.A.A. turnings (masticated), £42; Q.F. webbing, £49; defective Q.F. cups and cases, £49; Q.F. cut-offs, £47 10s.; Q.F. turnings, £38; other 70/30 process and manufacturing scrap, £46 10s.; process and manufacturing scrap containing over 62 per cent. and up to 68 per cent. Cu, £43 10s.; ditto, over 58 per cent. to 62 per cent. Cu, £38 10s.; 85/15 gilding metal webbing, £52 10s.; 85/15 gilding defective cups and envelopes before filling, £50 10s.; cap metal webbing, £54 10s.; 90/10 gilding webbing, £53 10s.; 90/10 gilding defective cups and envelopes before filling, £51 10s.

CUPRO NICKEL.—80/20 cupro-nickel webbing, £75 10s.; 80/20 defective cups and envelopes before filling, £70 10s.

NICKEL SILVER.—Process and manufacturing scrap: 10 per cent. nickel, £50; 15 per cent. nickel, £56; 18 per cent. nickel, £60; 20 per cent. nickel, £63.

COPPER.—Sheet cuttings and webbing, untinned, £54; shell-band plate scrap, £56 10s.; copper turnings, £48.

IRON AND STEEL SCRAP

(*Delivered free to consumers' works. Plus 3¾ per cent. dealers' remuneration. 50 tons and upwards over three months, 2s. 6d. extra.*)

South Wales.—Short heavy steel, not ex. 24-in. lengths, 82s. to 84s. 6d.; heavy machinery cast iron, 87s.; ordinary heavy cast iron, 82s.; cast-iron railway chairs, 87s.; medium cast iron, 78s. 3d.; light cast iron, 73s. 6d.

Middlesbrough.—Short heavy steel, 79s. 9d. to 82s. 3d.; heavy machinery cast iron, 91s. 9d.; ordinary heavy cast iron, 89s. 3d.; cast-iron railway chairs, 89s. 3d.; medium cast iron, 79s. 6d.; light cast iron, 74s. 6d.

Birmingham District.—Short heavy steel, 74s. 9d. to 77s. 3d.; heavy machinery cast iron, 92s. 3d.; ordinary heavy cast iron, 87s. 6d.; cast-iron railway chairs, 87s. 6d.; medium cast iron, 80s. 3d.; light cast iron, 75s. 3d.

Scotland.—Short heavy steel, 79s. 6d. to 82s.; heavy machinery cast iron, 94s. 3d.; ordinary heavy cast iron, 89s. 3d.; cast-iron railway chairs, 94s. 3d.; medium cast iron, 77s. 3d.; light cast iron, 72s. 3d.

(NOTE.—*For deliveries of cast-iron scrap free to consumers' works in Scotland, the above prices less 3s. per ton, but plus actual cost of transport or 6s. per ton, whichever is the less.*

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METALLURGICAL CHEMIST required for Foundry production of Special Cast Irons. Experience in Furnace Control an advantage. House available.—Application, stating previous experience, age, name of present employer and salary required, should be sent to THE MINISTRY OF LABOUR AND NATIONAL SERVICE, Central (Technical and Scientific) Register, Alexandra House, Kingsway, London, W.C.2, quoting O.N.F.1192X.

WANTED.—Manager for Iron and Brass Foundries, in Glasgow district. Weekly output 40 tons of grey iron and 40 tons of brass. Most castings subject to hydraulic tests. Desirable that applicants have wide experience of both machine and plate moulding and jobbing work. Please give outline of experience, class of work dealt with. State age and salary required. Housing can be arranged.—Box 870, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

PATENT

THE Proprietors of the Patent No. 502,295, for "Improvements in or relating to Alloying Molybdenum, and more particularly for Introducing Molybdenum into Iron or Steel," are desirous of entering into arrangements by way of licence and otherwise, on reasonable terms, for the purpose of exploiting the same and ensuring its full development and practical working in this country.—All communications should be addressed in the first instance to HASELTINE LAKE & Co., 28, Southampton Buildings, Chancery Lane, London, W.C.2.

BUSINESS FOR SALE

WELL equipped Iron and Brass Foundry in Midlands, including Freehold Premises.—Box 874, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

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WANTED.—One Compressed Air Jolt Squeeze Straight Draw MOULDING MACHINE and One Jolt Squeeze Rollover Moulding Machine. Both machines to take boxes approximately 20 in. by 18 in. Must be modern type and in good condition.—Apply, stating price and where machines can be seen, to Box 842, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

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Morgan Type "8" Oil-fired Tilting Furnace; 400-440 lbs. capacity.
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Sand Mills; 5 ft., 4 ft. 6 in., and 5 ft. 6 in.
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WANTED.—Iron Castings up to 15 cwt. capacity available; core work a speciality on repetition work; also Non-Ferrous Castings.—Box 868, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

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FOR SALE.—Foundry Steel Scrap. Analysis: Sulphur and phosphorus, 0.02 per cent.; copper, 9 per cent.; nickel, 2.4 per cent. At prices less than No. 2.—Box 872, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

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